



## Complete Summary

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### **GUIDELINE TITLE**

Guidelines for the field management of combat-related head trauma. Assessment: oxygenation and blood pressure.

### **BIBLIOGRAPHIC SOURCE(S)**

Knuth T, Letarte PB, Ling G, Moores LE, Rhee P, Tauber D, Trask A. Guidelines for the field management of combat-related head trauma. Assessment: oxygenation and blood pressure. New York (NY): Brain Trauma Foundation; 2005. 11 p. [20 references]

### **GUIDELINE STATUS**

This is the current release of the guideline.

## **COMPLETE SUMMARY CONTENT**

SCOPE  
METHODOLOGY - including Rating Scheme and Cost Analysis  
RECOMMENDATIONS  
EVIDENCE SUPPORTING THE RECOMMENDATIONS  
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS  
QUALIFYING STATEMENTS  
IMPLEMENTATION OF THE GUIDELINE  
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT  
CATEGORIES  
IDENTIFYING INFORMATION AND AVAILABILITY  
DISCLAIMER

## **SCOPE**

### **DISEASE/CONDITION(S)**

Hypoxemia and hypotension associated with combat-related severe traumatic brain injury

### **GUIDELINE CATEGORY**

Evaluation  
Management

### **CLINICAL SPECIALTY**

Emergency Medicine  
Neurological Surgery  
Neurology

## **INTENDED USERS**

Emergency Medical Technicians/Paramedics  
Physicians

## **GUIDELINE OBJECTIVE(S)**

- To provide dispassionate analysis of the known benefits and risks of therapies available to the brain injured patient in the field
- To be a resource and a tool for the combat medic, physician, commanding officer, and logistician who must then make the tough "on the ground" therapeutic, tactical, and logistical decisions that will ultimately result in optimum care for the injured combatant
- To guide identification of hypoxemia and hypotension as soon as available resources and the tactical situation allow

## **TARGET POPULATION**

Combat personnel who sustain traumatic brain injury in the field

## **INTERVENTIONS AND PRACTICES CONSIDERED**

1. Initial assessment, including airway patency and mental status
2. Assessment of oxygenation using a peripheral oxygen saturation (SPO<sub>2</sub>) monitor and addressing of low oxygenation as soon as possible
3. Measurement of blood pressure, including placement of a blood pressure monitoring device, when possible, and fluid resuscitation when necessary and possible
4. Assessment of carotid and radial pulses if blood pressure equipment not available

## **MAJOR OUTCOMES CONSIDERED**

Morbidity and mortality

## **METHODOLOGY**

### **METHODS USED TO COLLECT/SELECT EVIDENCE**

Hand-searches of Published Literature (Primary Sources)  
Hand-searches of Published Literature (Secondary Sources)  
Searches of Electronic Databases

### **DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE**

#### **General Search Strategy**

In order to create an evidence-based document relevant to the field treatment of brain injury, the literature was searched for each topic for publications on brain injury that pertained to the prehospital or austere environment. From the comprehensive literature searches, articles were selected which were relevant to the field management of traumatic brain injury (TBI) and utilized human data. Articles with outcomes related to morbidity and mortality were preferred. In establishing a literature base for recommendations, the guideline authors generally only include publications that involve human subjects. However, in these Guidelines, they have included some publications that involve training with mannequins given that such training is an accepted practice in assessing competency for emergency medical technician (EMT) certification. Additional studies were, in general, referenced only as a part of background discussion. The prehospital literature was heavily utilized; military literature was used where it was available.

### **Specific Strategy for This Topic**

MEDLINE was searched from 1966 to 2005 using the following search terms: "head injury" or "traumatic brain injury" and "airway" or "hypoxemia" or "hypotension" or "oxygenation assessment" or "blood pressure assessment" or "field assessment of oxygenation and blood pressure." References from the book, *Guidelines for Prehospital Management of Traumatic Brain Injury*, chapter on "Assessment: Oxygenation and Blood Pressure" were also reviewed. Some studies of in-hospital patients with severe head injury and hypotension were used to corroborate out-of-hospital hypotension studies.

### **NUMBER OF SOURCE DOCUMENTS**

16

### **METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE**

Weighting According to a Rating Scheme (Scheme Given)

### **RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE**

#### **Classification of Evidence**

**Class I:** Evidence from good quality, randomized, controlled clinical trials (RCT)

**Class II:** Evidence from moderate or poor quality RCT, good quality cohort, or good quality case-control studies

**Class III:** Evidence from moderate or poor quality cohort; moderate or poor quality case control; or case series, databases, or registries

Additional detail on quality criteria for each category is available in the original guideline document.

### **METHODS USED TO ANALYZE THE EVIDENCE**

## **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

The Guidelines follow the recommendations of the Institute of Medicine (IOM) Committee to Advise the Public Health Service on Clinical Practice Guidelines outlined below:

1. There should be a link between the available evidence and the recommendations.
2. Empirical evidence should take precedence over expert judgment in the development of guidelines.
3. The available scientific literature should be searched using appropriate and comprehensive search terminology.
4. A thorough review of the scientific literature should precede guideline development.
5. The evidence should be evaluated and weighted, depending on the scientific validity of the methodology used to generate the evidence.
6. The strength of the evidence should be reflected in the strength of the recommendations, reflecting scientific certainty (or lack thereof).
7. Expert judgment should be used to evaluate the quality of the literature and to formulate guidelines when the evidence is weak or nonexistent.
8. Guideline development should be a multidisciplinary process, involving key groups affected by the recommendations.

## **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus

## **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

The authors of these guidelines, entitled *Guidelines for the Field Management of Combat-Related Head Trauma*, represented a multidisciplinary group consisting of neurosurgeons, trauma surgeons, neurointensivists, and paramedics from both the civilian and the military sectors. They were selected for their expertise in traumatic brain injury (TBI), combat medicine, or military medical education. All the military authors had recent combat experience. Each author independently conducted a MEDLINE or comparable search, reviewed and evaluated the literature for their assigned topics, then cooperated in formulating the Guidelines during several work sessions aimed at completing understandable and applicable recommendations based on the best evidence available. The template for these Guidelines was the first edition of the *Guidelines for Prehospital Management of Traumatic Brain Injury* developed by Brain Trauma Foundation (BTF) in 1999–2000.

Section I of each chapter in the original guideline document describes the conclusions the authors formulated from the literature. For the chapters on assessment, which included prognosis studies, the authors summarized the evidence rather than made recommendations. Thus, their findings are listed as "Conclusions" for any diagnostic or prognostic assessment and as "Recommendations" where the end result is a specific treatment or set of

treatment options. Section VII in each chapter provides a brief analysis of the literature that supports the conclusions or recommendations, whereas Section VIII references a more extensive list of studies.

## **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

### **Degrees of Certainty\***

**Standards:** Reflect a *high degree of clinical certainty* as indicated by the scientific evidence available (supported by Class I evidence).

**Guidelines:** Reflect a *moderate degree of clinical certainty* as indicated by the scientific evidence available (supported by Class II evidence).

**Options:** Reflect *unclear clinical certainty* as indicated by the scientific evidence available (supported by Class III evidence).

\*For the chapters on assessment, which included prognosis studies, the guideline authors summarized the evidence rather than made recommendations. Thus, their findings are listed as "Conclusions" for any diagnostic or prognostic assessment, and no "degrees of certainty" were assigned.

## **COST ANALYSIS**

A formal cost analysis was not performed and published cost analyses were not reviewed.

## **METHOD OF GUIDELINE VALIDATION**

External Peer Review  
Internal Peer Review

## **DESCRIPTION OF METHOD OF GUIDELINE VALIDATION**

At several points during the development process, a review team comprised of representatives of the armed services medical "school houses," military neurosurgery and trauma surgery, and military medic instruction evaluated the document, and their comments were delivered to the authors. Several draft documents were produced and evaluated before this document was finalized and published. (The names of the reviewers are listed at the front of the original guideline document.)

## **RECOMMENDATIONS**

### **MAJOR RECOMMENDATIONS**

**Note from the Brain Trauma Foundation (BTF) and the National Guideline Clearinghouse (NGC):** For the chapters on assessment, which included prognosis studies, the guideline authors summarized the evidence rather than

made recommendations. Thus, their findings are listed as "Conclusions" for any diagnostic or prognostic assessment, and no "degrees of certainty" were assigned.

## **Conclusions**

- A. Hypoxemia and hypotension are two considerable factors associated with poor prognosis in severe traumatic brain injury (TBI) patients in the prehospital setting.
- B. All reasonable efforts should be made to avoid hypoxemia and hypotension in the brain injured casualty. Reasonable efforts will be dictated by situation, available resources, and the tactical situation.
  - 1. Hypoxemia should be prevented in the brain injured casualty. Pulse oxymetry should be instituted as soon as possible along the chain of evacuation. Low oxygenation should be addressed as soon as it is practical to do so along the chain of evacuating.
  - 2. Hypotension should be avoided. Blood pressure (BP) should be measured as soon as possible along the chain of evacuation. Fluid resuscitation should be instituted for patients with systolic pressure <90 as soon as resources and the tactical situation allow.

## **Level of Care Recommended within Certain Tactical and Operational Limitations**

- A. *Combat Medic/Tactical Assessment*: Determine patency of airway and note any obstruction. Ask the patient to speak. Look at the patient's chest and observe breathing motion. Feel for carotid and radial pulses. Mental status is very useful in assessing non-comatose patients since inadequate oxygenation and blood pressure may also alter mental status.
- B. *Evacuation Assessment*: Measure oxygenation with a peripheral oxygen saturation (SPO<sub>2</sub>) monitor. Measure BP and record. When possible, place a BP monitoring device.
- C. *Battalion Aid Station Assessment*: If possible, measure oxygenation with SPO<sub>2</sub> monitor. When equipment is not available, assess patient as recommended for first responder. Measure BP and record. When equipment is not available, feel for carotid and radial pulses.
- D. *Forward Surgical Assessment*: Measure oxygenation with SPO<sub>2</sub> monitor. Measure BP with BP monitoring device.

## **Summary**

Patients with hypoxemia or hypotension have poorer outcomes from TBI than patients who avoid these conditions. It would therefore seem appropriate to correct these conditions as soon as resources and tactical situation allow.

A structured and prioritized approach to combat casualties is important because it enables a clear assessment process for the medic to follow. The guideline authors acknowledge the Advanced Trauma Life Support Course™ of the Committee on Trauma of the American College of Surgeons. The course prioritizes airway before breathing and breathing before blood pressure and these strategies have been adopted worldwide. Other accepted methodological approaches to the comprehensive assessment and management of the TBI patient can be found in various sources. Standardized assessments are crucial to the appropriate

assessment and then subsequent proper management of casualties in the forward area.

### **CLINICAL ALGORITHM(S)**

A clinical algorithm for "Field Management of Combat-Related Head Trauma" is provided in the original guideline document.

## **EVIDENCE SUPPORTING THE RECOMMENDATIONS**

### **TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS**

An evidentiary table appears at the end of each major section of the guideline document, which classifies each citation based on the quality of the evidence.

The conclusions are supported by class III evidence (16 references), which include one or more of the following types of studies: moderate or poor quality cohort; moderate or poor quality case control; or case series, databases, or registries.

## **BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS**

### **POTENTIAL BENEFITS**

Appropriate assessment of oxygenation and blood pressure in patients with combat-related head trauma

### **POTENTIAL HARMS**

Not stated

## **QUALIFYING STATEMENTS**

### **QUALIFYING STATEMENTS**

- The information contained in the *Guidelines for the Field Management of Combat-Related Head Trauma*, which reflects the current state of knowledge at the time of completion (November 2005), is intended to provide accurate and authoritative information about the subject matter covered. Because there will be future developments in scientific information and technology, it is anticipated that there will be periodic review and updating of these Guidelines. These Guidelines are distributed with the understanding that the Brain Trauma Foundation is not engaged in rendering professional medical services. If medical advice or assistance is required, the services of a competent physician should be sought. The recommendations contained in these Guidelines may not be appropriate for use in all circumstances. The decision to adopt a particular recommendation contained in these Guidelines must be based on the judgment of medical personnel, who take into consideration the facts and circumstances in each case and on the available resources.

- The majority of available recommendations are extrapolated from civilian data. In some instances, it will be obvious that the best civilian data have direct application to military scenarios. In others, it will be equally obvious that the best available civilian recommendation is impractical at best, and potentially threatening to life or mission accomplishment at worst. The guideline authors have attempted to discriminate between the two as often as possible, based on the available military-specific literature and personal experience. Ultimately, it will be the decision of the individual medic and/or the unit chain of command as to whether a particular diagnostic or therapeutic maneuver can be implemented. The general direction the authors have taken with their recommendations is that the best-known community standard should be implemented whenever possible.
- The recommendations in these guidelines are based on the best available data, and the authors maintained a patient-driven focus during development. In other words, each recommendation was created based upon the best care possible for the patient, in spite of the fact that tactical limitations may prevent this level of care from actually being available to all patients at all times. It should also be noted that guidelines such as these are quite different than protocols developed by medical facilities or military units. Protocols should be generated locally to give very specific directions as to how individual providers are to act in a variety of situations. Guidelines such as these are intended to serve as a starting point for the development of facility-specific protocols.
- Factors that create limitations in the level of medical care available in the combat environment include the overall tactical scenario, physiologic parameters associated with combat, and logistics. The guideline authors' ability to develop standards for optimal management is limited by a lack of scientific data. The majority of the recommendations provided are extrapolated from civilian data. While many of these recommendations will be both practical and applicable, the ability of the individual medic to provide this care may be limited.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Clinical Algorithm

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better



## **IOM DOMAIN**

Effectiveness

### **IDENTIFYING INFORMATION AND AVAILABILITY**

#### **BIBLIOGRAPHIC SOURCE(S)**

Knuth T, Letarte PB, Ling G, Moores LE, Rhee P, Tauber D, Trask A. Guidelines for the field management of combat-related head trauma. Assessment: oxygenation and blood pressure. New York (NY): Brain Trauma Foundation; 2005. 11 p. [20 references]

#### **ADAPTATION**

Not applicable: The guideline was not adapted from another source.

#### **DATE RELEASED**

2005

#### **GUIDELINE DEVELOPER(S)**

Brain Trauma Foundation - Disease Specific Society

#### **SOURCE(S) OF FUNDING**

Brain Trauma Foundation

Uniformed Services University of the Health Sciences

#### **GUIDELINE COMMITTEE**

Not stated

#### **COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE**

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## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

Not stated

## **GUIDELINE STATUS**

This is the current release of the guideline.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available in Portable Document Format (PDF) from the [Brain Trauma Foundation Web site](#).

Print copies: Available from the Brain Trauma Foundation, 708 Third Avenue, New York, NY 10017

## **AVAILABILITY OF COMPANION DOCUMENTS**

None available

## **PATIENT RESOURCES**

None available

## **NGC STATUS**

This NGC summary was completed by ECRI Institute on August 24, 2007. The information was verified by the guideline developer on January 28, 2008.

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